

WHAT IS CLAIMED IS:

1 1. A furnace for heating glass sheets comprising:
2 a housing having a pair of side walls, a floor and a ceiling that
3 cooperate to define a heating chamber;
4 a roll conveyor for conveying glass sheets through the heating
5 chamber along a direction of conveyance;
6 a forced convection heater located within the housing and including
7 a gas burner assembly generally adjacent one of the housing side walls, and the gas
8 burner assembly including an outlet through which heated products of combustion
9 from the gas burner assembly are supplied to the heating chamber at a location
10 intermediate the housing side walls; and
11 the forced convection heater also including a hot gas distributor
12 located within the housing generally adjacent the other side wall and including an
13 inlet that is spaced from the outlet of the gas burner assembly intermediate the
14 housing side walls, the hot gas distributor having a suction fan for drawing the
15 heated products of combustion from the outlet of the gas burner assembly together
16 with spent recirculating gas in the heating chamber into the hot gas distributor
17 through its inlet for mixing to provide heated gas, and the hot gas distributor
18 having distribution openings through which the mixed heated gas is distributed to
19 the conveyed glass sheets on the roll conveyor to provide heating of the glass
20 sheets.

1 2. A furnace for heating glass sheets as in claim 1 which
2 included a plurality of the forced convection heaters positioned along the direction
3 of conveyance both below and above the roll conveyor to provide upwardly and
4 downwardly directed heated gas flows to the conveyed glass sheets on the roll
5 conveyor to provide the heating of the glass sheets.

1 3. A furnace for heating glass sheets as in claim 1 wherein the
2 midpoint between the side walls of the housing is located between the outlet of the
3 gas burner assembly and the inlet of the hot gas distributor.

1 4. A furnace for heating glass sheets as in claim 1 wherein the
2 gas burner assembly includes a delivery tube having an outer end mounted by the
3 one side wall, the gas burner assembly having a gas burner mounted by the one
4 side wall within the delivery tube adjacent its mounted outer end, and the delivery
5 tube having an inner end that defines the outlet of the gas burner assembly through
which the heated products of combustion from the gas burner are supplied.

1 5. A furnace for heating glass sheets as in claim 1 wherein the
2 gas burner assembly includes a delivery tube having an outer end mounted by the
3 one side wall, the gas burner assembly having a gas burner mounted by the one
4 side wall within the delivery tube adjacent its mounted outer end, the delivery tube
5 having an inner end that defines the outlet of the gas burner assembly through which
6 the heated products of combustion from the gas burner are supplied, and the
7 midpoint between the side walls of the housing being located between the outlet of
8 the gas burner assembly and the inlet of the hot gas distributor.

1 6. A furnace for heating glass sheets as in claim 1 wherein the
2 outlet of the gas burner assembly includes an adjustable damper for controlling the
3 flow of the heated products of combustion into the heating chamber.

1 7. A furnace for heating glass sheets as in claim 1 wherein the
2 gas burner assembly includes a delivery tube, the gas burner assembly having gas
3 burner that is received within the delivery tube, the delivery tube including an inner
4 end defining the outlet of the gas burner assembly, the delivery tube including
5 openings through which a portion of the heated products of combustion from the gas
6 burner flow outwardly without passing through the outlet at the inner end of the
7 delivery tube, and the outlet of the gas burner assembly including a damper that is
8 adjustable to control the relative amounts of the heated products of combustion that
9 flow through the openings of the delivery tube and through the outlet at the inner
10 end of the delivery tube.

1 8. A furnace for heating glass sheets as in claim 7 further
2 including an enclosure in which the delivery tube with the gas burner therein is
3 received, the inner end of the delivery tube opening outwardly through the
4 enclosure into the heating chamber adjacent the inlet of the hot gas distributor, and
5 the enclosure having openings through which the heated products of combustion that
6 pass outwardly through the openings of the delivery tube can pass outwardly from
7 the enclosure into the heating chamber.

1 9. A furnace for heating glass sheets as in claim 1 wherein the
2 gas burner assembly includes a delivery tube, the gas burner assembly having gas
3 burner that is received within the delivery tube, the delivery tube having an inner
4 end defining the outlet of the gas burner assembly, the delivery tube including
5 openings through which a portion of the heated products of combustion from the
6 gas burner flow outwardly without passing through the outlet at the inner end of
7 the delivery tube, the outlet of the gas burner assembly including a damper that is
8 adjustable to control the relative amounts of the heated products of combustion that
9 flow through the openings of the delivery tube and through the outlet at the inner
10 end of the delivery tube, an enclosure in which the delivery tube with the gas burner
11 therein is received, the inner end of the delivery tube opening outwardly through
12 the enclosure into the heating chamber adjacent the inlet of the hot gas distributor,
13 the enclosure having openings through which the heated products of combustion that
14 pass outwardly through the openings of the delivery tube can pass outwardly from
15 the enclosure into the heating chamber, and the midpoint between the side walls of
16 the housing being located between the outlet of the gas burner assembly and the
17 inlet of the hot gas distributor.

1 10. A furnace for heating glass sheets comprising:
2 a housing having a pair of side walls, a floor and a ceiling that
3 cooperate to define a heating chamber;
4 a roll conveyor for conveying glass sheets through the heating
5 chamber along a direction of conveyance;

6 a plurality of forced convection heaters spaced along the direction of
7 conveyance both below and above the roll conveyor within the housing, each forced
8 convection heater including a gas burner assembly generally adjacent one of the
9 housing side walls, the gas burner assembly including a delivery tube having an
10 outer end and a gas burner mounted by the one side wall within the outer end of
11 the delivery tube, and the delivery tube having an inner end that defines an outlet
12 of the gas burner assembly through which heated products of combustion from the
13 gas burner are supplied to the heating chamber at a location intermediate the
14 housing side walls; and

15 each forced convection heater also including a hot gas distributor
16 located within the housing generally adjacent the other side wall and including an
17 inlet that is spaced from the outlet of its gas burner assembly intermediate the
18 housing side walls, the hot gas distributor having a suction fan for drawing the
19 heated products of combustion from the outlet of the gas burner assembly together
20 with spent recirculating gas in the heating chamber into the hot gas distributor
21 through its inlet for mixing to provide heated gas, and the hot gas distributor
22 having distribution openings through which the mixed heated gas is distributed to
23 the conveyed glass sheets on the roll conveyor to provide heating of the glass
24 sheets.

1 11. A furnace for heating glass sheets comprising:

2 a housing having a pair of side walls, a floor and a ceiling that
3 cooperate to define a heating chamber;

4 a roll conveyor for conveying glass sheets through the heating
5 chamber along a direction of conveyance;

6 a plurality of forced convection heaters spaced along the direction of
7 conveyance both below and above the roll conveyor within the housing, each
8 forced convection heater including a gas burner assembly generally adjacent one of
9 the housing side walls, the gas burner assembly including a delivery tube having an
10 outer end and a gas burner mounted by the one side wall within the outer end of
11 the delivery tube, the delivery tube having an inner end that defines an outlet of the
12 gas burner assembly through which heated products of combustion from the gas
13 burner are supplied to the heating chamber at a location intermediate the housing

14 side walls, the outlet of each gas burner assembly including an adjustable damper
15 at the inner end of the delivery tube for controlling the flow of the heated products
16 of combustion into the heating chamber; and

17 each forced convection heater also including a hot gas distributor
18 located within the housing generally adjacent the other side wall and including an
19 inlet that is spaced from the outlet of its gas burner assembly intermediate the
20 housing side walls, the hot gas distributor having a suction fan for drawing the
21 heated products of combustion from the outlet of the gas burner assembly together
22 with spent recirculating gas in the heating chamber into the hot gas distributor
23 through its inlet for mixing to provide heated gas, and the hot gas distributor
24 having distribution openings through which the mixed heated gas is distributed to
25 the conveyed glass sheets on the roll conveyor to provide heating of the glass
26 sheets.

1 12. A method for heating glass sheets comprising:
2 conveying glass sheets on a roll conveyor along a direction of
3 conveyance within a heating chamber cooperatively defined by side walls, a floor
4 and a ceiling of a housing;
5 supplying heated products of combustion from a gas burner assembly
6 mounted adjacent one side wall of the housing through an outlet of the gas burner
7 assembly into the heating chamber at a location intermediate the housing side walls;
8 drawing the heated products of combustion from the outlet of the gas
9 burner assembly together with spent recirculating gas in the heating chamber into
10 a hot gas distributor through an inlet thereof for mixing to provide heated gas; and
11 distributing the mixed heated gas to the conveyed glass sheets on the
12 roll conveyor to provide heating of the glass sheets.

1 13. A method for heating glass sheets as in claim 12 wherein the
2 heated products of combustion are supplied from a plurality of gas burner
3 assemblies spaced along the direction of conveyance both above and below the roll
4 conveyor, the heated products of combustion along with spent recirculating gas
5 being drawn from the outlets of the gas burner assemblies into inlets of associated
6 hot gas distributors spaced along the direction of conveyance both below and above

7 the roll conveyor for mixing to provide heated gas, and the mixed heated gas being
8 distributed both upwardly and downwardly to the conveyed glass sheets on the roll
9 conveyor to provide heating of the glass sheets.

1 14. A method for heating glass sheets as in claim 12 wherein the
2 heated products of combustion are supplied from the outlet of the gas burner
3 assembly to the heating chamber at a midpoint between the side walls of the
4 housing.

1 15. A method for heating glass sheets as in claim 12 wherein an
2 adjustable damper controls the flow of the heated products of combustion through
3 the outlet of the gas burner assembly.

1 16. A method for heating glass sheets comprising:
2 conveying glass sheets on a roll conveyor along a direction of
3 conveyance within a heating chamber cooperatively defined by side walls, a floor
4 and a ceiling of a housing;

5 burning gas in a plurality of gas burners to provide heated products
6 of combustion within associated delivery tubes of a plurality gas burner assemblies
7 spaced along the direction of conveyance both above and below the roll conveyor;

8 supplying the heated products of combustion through outlets of the
9 gas burner assemblies with the outlets provided by an inner ends of the delivery
10 tubes for flow into the heating chamber at a location intermediate the housing side
11 walls;

12 drawing the heated products of combustion from the outlets of the gas
13 burner assemblies together with spent recirculating gas in the heating chamber into
14 inlets of hot gas distributors spaced along the direction of conveyance both below
15 and above the roll conveyor through an inlet thereof for mixing to provide heated
16 gas;

17 mixing the heated products of combustion and the spent recirculating
18 gas from the heating chamber within the hot gas distributors to provide mixed
19 heated gas; and

- 20 distributing the mixed heated gas upwardly and downwardly to the
- 21 conveyed glass sheets on the roll conveyor to provide heating of the glass sheets.

20 distributing the mixed heated gas upwardly and downwardly to the
21 conveyed glass sheets on the roll conveyor to provide heating of the glass sheets.